

WHAT IS CLAIMED IS:

1. A lubricating device for a planetary gear unit of an automatic power transmission which has an operation mode wherein when, under rotation of an input shaft, a pinion carrier is prevented from making a revolution, pinions carried by the pinion carrier are rotated,
the lubricating device comprising:
 - a structure defining a first oil passage, the first oil passage being formed in a fixed wall of the transmission and adapted to be connected with an oil supply source;
 - a structure defining a second oil passage, the second oil passage being formed in the input shaft, the input shaft being rotatably held by the fixed wall;
 - a structure defining a third oil passage, the third oil passage being formed in the pinion carrier to feed the pinions with the lubrication oil, the pinion carrier being concentrically disposed around an axis of the input shaft;
 - a structure defining a first connection passage, the first connection passage connecting the first and second oil passages, the first connection passage including a first bore that is formed in the input shaft to lead the oil from the first oil passage to the second oil passage, and a second bore that is formed in the input shaft to lead the oil from the second oil passage to the first oil passage; and
 - a structure defining a second connection passage, the second connection passage connecting the first and third oil passages.
2. A lubricating device as claimed in Claim 1, in which a sectional area of the second bore is smaller than that of the first bore.

3. A lubricating device as claimed in Claim 1, in which the first oil passage comprises:

- an upstream oil passage;
- a first branch passage that connects a downstream part of the upstream oil passage to the first bore; and
- a second branch passage that connects the downstream part of the upstream oil passage to the second bore.

4. A lubricating device as claimed in Claim 3, in which the second branch passage and the second bore are connected through a given space in which a thrust bearing is installed, the thrust bearing being interposed between the fixed wall and the input shaft to bear a thrust force exerted on the input shaft.

5. A lubricating device as claimed in Claim 4, in which the second connection passage comprises:

- a carrier connection passage formed in a cylindrical outer surface of the input shaft and connected to the given space; and
- openings formed in a bush that is disposed between a cylindrical outer surface of the input shaft and a cylindrical inner surface of a center circular bore formed in the pinion carrier.

6. A lubricating device for a planetary gear unit of an automatic power transmission which includes a fixed wall, an input shaft rotatably supported by the fixed wall, a pinion carrier rotatably disposed about an axis of the input shaft, pinion shafts held by the pinion carrier, long pinions rotatably held by first group of the pinions, short pinions rotatably held by second group of the pinions, a first ring gear meshed with the long pinions, a second ring gear meshed with the short pinions, a first annular plate having a radially outer periphery secured to the first ring gear and a radially inner portion placed between the pinion carrier and a circular flange of the input shaft, a first ring gear

bearing held by the radially inner portion of the annular plate to bear the pinion carrier and the circular flange, a second annular plate having a radially outer periphery secured to the second ring gear and a radially inner portion, an annular block member fixed to the pinion shafts, and a second ring gear bearing held between the radially inner portion of the second annular plate and the annular block member, the automatic power transmission having an operation mode wherein when, under rotation of the input shaft, the pinion carrier is prevented from making a revolution, the long and short pinions and the first and second ring gears are rotated,

the lubricating device comprising:

- a structure defining a first oil passage, the first oil passage being formed in the fixed wall and adapted to be connected with an oil supply source;
- a structure defining a second oil passage, the second oil passage being formed in the input shaft;
- a structure defining a third oil passage, the third oil passage being formed in the pinion carrier to feed the long and short pinions with the lubrication oil;
- a structure defining a first connecting passage, the first connection passage connecting the first and second oil passages, the first connection passage including a first bore that is formed in the input shaft to lead the oil from the first oil passage to the second oil passage, and a second bore that is formed in the input shaft to lead the oil from the second oil passage to the first oil passage; and
- a structure defining a second connecting passage, the second connecting passage connecting the first and third oil passages.

7. A lubricating device as claimed in Claim 6, in which a sectional area of the second bore is smaller than that of the first bore.
- 5 8. A lubricating device as claimed in Claim 6, in which the first oil passage comprises:
an upstream oil passage;
a first branch passage that connects a downstream part of the upstream oil passage to the first bore; and
10 a second branch passage that connects the downstream part of the upstream oil passage to the second bore.
9. A lubricating device as claimed in Claim 8, in which the second branch passage and the second bore are connected
15 through a given space in which a thrust bearing is installed, the thrust bearing being interposed between the fixed wall and the input shaft to bear a thrust force exerted on the input shaft.
10. A lubricating device as claimed in Claim 9, in which the
20 second connection passage comprises:
a carrier connection passage formed in a cylindrical outer surface of the input shaft and connected to the given space; and
openings formed in a bush that is disposed between a cylindrical outer surface of the input shaft and a cylindrical inner
25 surface of a center circular bore formed in the pinion carrier.
11. A lubricating device as claimed in Claim 6, further comprising a structure defining a fourth oil passage that extends from the second connecting passage to the first ring gear bearing
30 to feed the same with the lubrication oil.
12. A lubricating device as claimed in Claim 6, further comprising a structure defining a fifth oil passage that extends

from the third oil passage to the second ring gear bearing to feed the same with the lubrication oil.

13. A lubricating device as claimed in Claim 12, in which the
5 fifth oil passage comprises:
 an annular groove formed in the annular block member and
 connected with the third oil passage; and
 a plurality of bores formed in the annular block member,
 each bore extending from the annular groove to the second ring
10 gear bearing.